# CHARACTERIZATION OF LOOP SEAL IN A COMPLEX CIRCULATING FLUIDIZED BED SYSTEM

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Loop seal is widely used in circulating fluidized bed systems to transport solids from high pressure reactor to low pressure reactor. It also found applications in complex systems with multiple reactors. The functions of the loop seal include circulating solids between reactors with desired solids flow rate, preventing gas leak from either reactor, and providing pressure balance for the proper operation of the system. The proper design and sizing of the loop seal are necessary so that the operation of loop seal is not to disturb the desired, independent operation of the reactors. Despite its extensive applications, the systematic, experimental studies that characterize the loop seal operation in the complex reactor systems are limited. Among the available studies, the particles used are mainly Geldart group A and group B particles. Little is conducted on experiments with Geldart Group D particles. This paper examines the operation of solids through a loop seal in a complex circulating fluidized bed system using Geldart group D particles. The circulating fluidized bed has two reactors whose operational conditions are controlled independently, with a loop seal placed between them. Besides the loop seal and the two reactors, the CFB system also includes a riser, a cyclone, a solids receiver, and standpipes. The solids inlet in the supply chamber of the loop seal is connected to the bottom of the standpipe, while the solids outlet in the return chamber is connected to the solids inlet of a dense phase fluidized bed reactor. A gas outlet with a valve and a gas flowmeter is designed to be located at the top of the return chamber to control the gas flow rate flowing into the fluidized bed reactor downstream the loop seal. The rectangular supply chamber has a dimension of 25 mm x 75 mm x 150 mm and the square return chamber is 75 mm × 75 mm × 300 mm. The pressure profile of the system is recorded using differential pressure gauges and pressure gauges are installed throughout the system. The solids circulation rate of the system is measured using a solids bypassing system connected between the bottom of the system and the top of the standpipe. Effects of operating parameters, such as supply chamber gas flow rate, return chamber fluidization velocity, and gas flow rate from the gas outlet of return chamber, on the operation of the circulating fluidized bed system, including the solids circulation rate and the system pressure balance are also analyzed and discussed.